ERIC Document Resume | See Instruction Sheet | DATE OF RESUME 5/31/65 | DATE RECEIVED

PUBLICATION DATA

1. ERIC NUMBER: 0244
2. ORIGINATOR CONTROL NO(S).: 8068
3. IDENTIFICATION NO.: N.A.

DO NOT WRITE IN SPACE BELOW

4. AUTHOR(S):
Spilman, Edra

5. TITLE OF DOCUMENT ABSTRACTED:
The Multidiscipline Laboratories

6. PUBLICATION TITLE:
Journal of Medical Education

7. EDITOR(S):
None

8. PUBLISHER OR SOURCE:
Western Reserve University

8. PLACE OF ORIGIN
ORG. Western Reserve University
ST.
CITY. Cleveland, Ohio
TELE. EXT
INST/LOC CODE

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TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

OTHER ERIC REFERENCES:

ERIC SATELLITE CODE

9. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
XXXII	168-174	Feb. 58	7

INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR
Case study (?)

16. INDEXING TERMS (8-12)

Laboratories	integration	teaching aids		
Bldgs. and equip.	independent study			
Medical edu.	study activity			

17. ABSTRACT (MAX. 250 WORDS)

A description of a multidiscipline laboratory developed at Western Reserve School of Medicine designed to implement the major objectives of the integrated medical education program and to provide knowledge, skill, and the development of student habits of self-education.

This laboratory plan gives each student his own work space for all lab work, in all departments, and is open to him at all times, providing a single coherent base of operations. The plan also serves to centralize and coordinate laboratory activities, thus cutting down problems of logistics and personnel.

IC No.

18. SOURCE OF ABSTRACT
Reporter No. 6

C. FUNDING DATA

19. SUPPORTING ORGANIZATION	20. DIVISION OR DEPT.	21. CONTRACT NO. / PROJECT NO.
	22. TOTAL COST OF PROJECT	
	23. DURATION OR PROJECT	U.S. Department of Health, Education, and Welfare Office of Education

R-6-8

The Multidiscipline Laboratories *

EDRA SPILMAN, PH.D.†

THE MULTIDISCIPLINE LABORATORIES at the School of Medicine were designed to implement the major objectives of the integrated medical education program which are to provide the student with adequate knowledge and skill, to foster proper attitudes, and to develop habits of self-education.

Plans for the laboratories were begun in 1948 by the committee on curriculum and instruction under the chairmanship of Dr. R. F. Parker. In 1951 detailed planning was initiated through the subcommittee on facilities for students by Dr. L. O. Krampitz, chairman, and Drs. N. L. Hoerr, W. McK. Jefferies, A. R. Moritz, W. Sakami, E. E. Selkurt, A. D. Welsh, and J. W. Patterson '49. Designs for laboratory layout and furniture were done by Leon Gordon Miller, Cleveland; architects were Garfield, Harris, Robinson and Schafer, Cleveland; the laboratory benches and desks were manufactured to specifications by the Variety Cabinet Company, Cleveland, and chairs were obtained from the Toledo Furniture Manufacturing Company, Toledo, Ohio.

FUNCTIONS

The first function of the multidiscipline laboratories is to give each student his own single work area in which all laboratory exercises can be performed. This is in contrast with the type of curriculum in which each department operates a laboratory for its own teaching program.

Less obvious is the second function—that of giving each student the feeling of "belonging" by assigning him to a "home base." This personal work area is available to the student 24 hours a day, seven days a week through the year, and provides one of the benefits routinely given to graduate students.

The third function is to centralize and coordinate laboratory operations from the standpoint of logistics and personnel. Previously each department supplied a part-time helper. With the present facilities two full-time helpers (one for Phase 1 and another for Phase 2) are needed to prepare for laboratory exercises during the school year, and to repair and stock during slack seasons.

THE THREE LABORATORIES

There are three multidiscipline laboratories: one for the first year (Phase 1) on the fifth floor of the School, one for the second year (Phase 2A) in the basement of the School, and one for the first half of the third year (Phase 2B) on the first floor of the Institute of Pathology.

PHASE 1. The phase 1 laboratory is a departure from the customary single large facility. There are six small rooms—five for sixteen students and one equipped for twelve. In each of the rooms (with the one exception) there are two movable benches on either side of each of four sinks, and writing desks are along the wall. An accessory work table is used for communal equipment and supplies, and large "green" blackboards are at either end of the room.

*Reprinted with permission, from the Western Reserve University School of Medicine, Alumni Bulletin, Second Quarter 1957.

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ED000294

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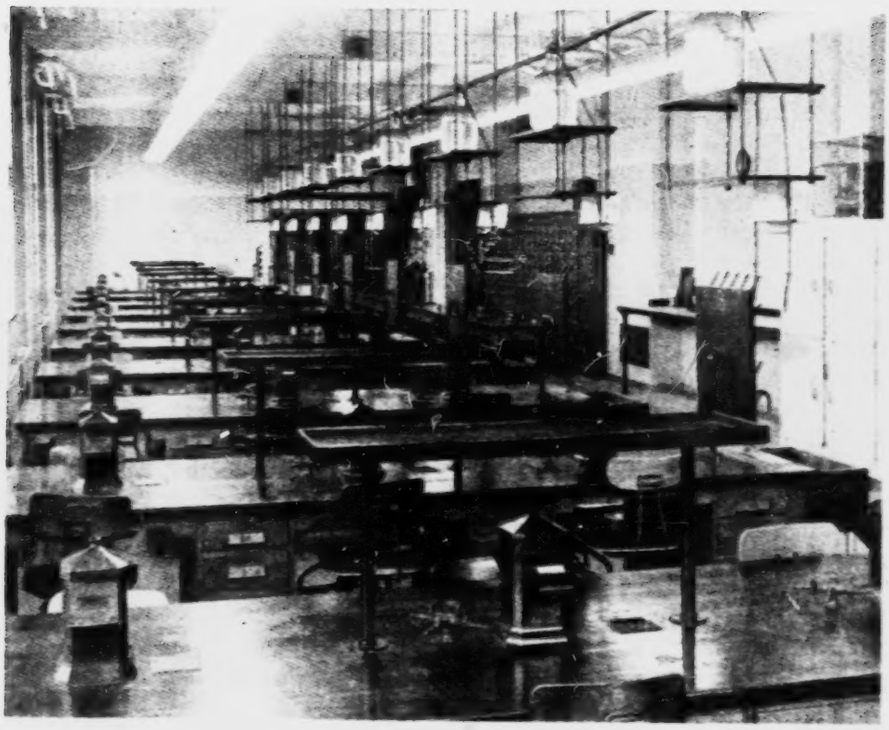
FIGURE 1. Phase 2B Laboratory



Accessory rooms, located along the center hall of the fifth floor, include an animal room, cold room, stock room, and physiology preparation rooms. The fifth floor is lighted by "Day-Bright" fluorescent lighting, has no windows, and is air conditioned. (The animal room and stock room are air conditioned, but are vented to the outside of the building.) This floor was constructed for ultimate use for experiments with small animals, and easy conversion is possible.

PHASE 2A. The Phase 2A laboratory is one large area (140′ x 22′) with facilities for 80 students. The room can be subdivided into 10 smaller units by folding plastic doors. Each unit has four movable benches grouped around a sink. There are windows along one of the walls and communal accessory shelves along the other. The laboratory opens into a main corridor by six doors. Animal and stock rooms are located on the opposite side of this corridor.

PHASE 2B. The Phase 2B laboratory (Figure 1) in the Institute of Pathology, is used primarily for microscopic studies and has desks and work benches accommodating 82 students. Stock and accessory rooms are along the hall into which the laboratory opens.

ANATOMY DISSECTION. During the first year, dissection of the stillborn infant is performed in the Phase 1 laboratory with specimens stored on the same floor in a cold room. The infant cadavers are wrapped and kept in individual, covered, stainless steel trays. An adult human cadaver is

dissected during the three semesters of Phase 2 and the specimens are kept and dissected in the dissecting room of the department of anatomy, first floor of the School of Medicine.

The Laboratory Bench

The laboratory benches were designed around a study of equipment used by all of the departments involved in multidiscipline teaching. The benches accommodate the various types of equipment originally contained in the benches of departmental laboratories. In addition, provisions were made for specific types of equipment, such as kymographs, built-in brass flanges for kymograph rods, space to house microscopes, and long drawers for burettes.

A laboratory bench in Phase 1 is shared by two students (Figure 2). It has a surface work area of 3′ by 5′, a height of 36″ and is designed for the student to stand. One end adjoins a side of a sink where gas, air, and vacuum lines are provided for each student, and over the sink is a provision for glass drying and distilled water storage. The bench contains two sets of 5 drawers of varying depth, two locked cabinets, and one locked drawer. The bench, mounted on casters, may be moved but it remains connected to electrical current by heavy duty extension cord.

The Phase 1 desk (Figure 3) has a working area of 2′ by 3′, is 29″ high and is designed for the student to be seated. It contains a locked bookcase running the full width of the desk above and a drawer and pull-out board beneath the writing surface. The chairs are of metal structure with plywood swivel seats and backs.

Figure 2. Phase 1 Laboratory Bench

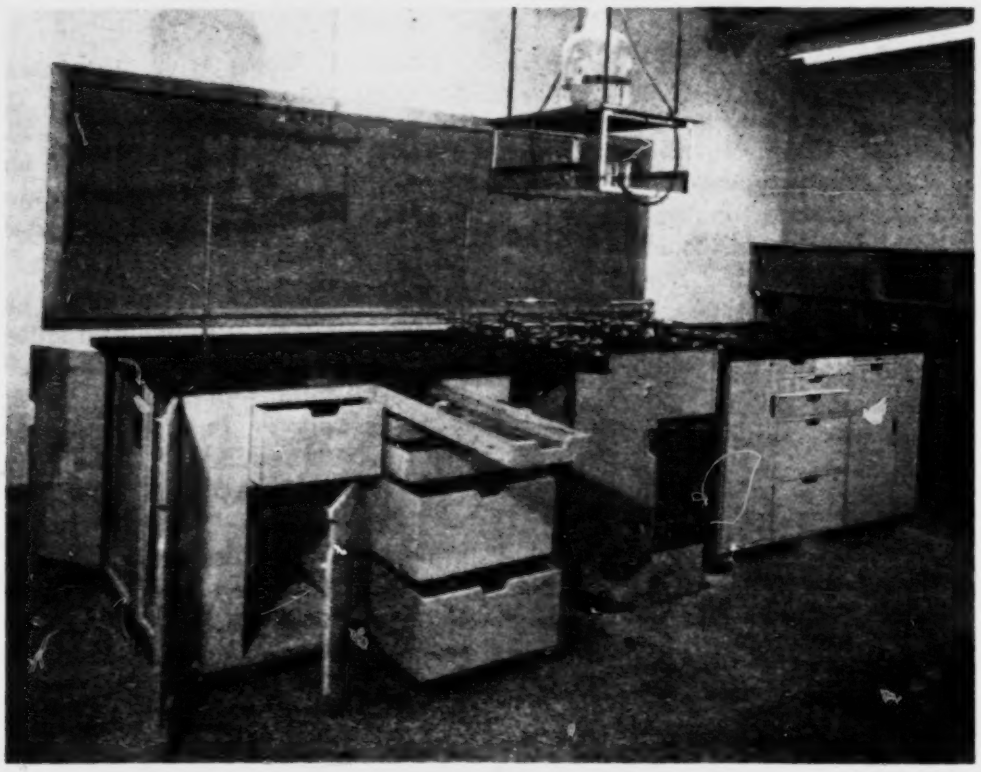
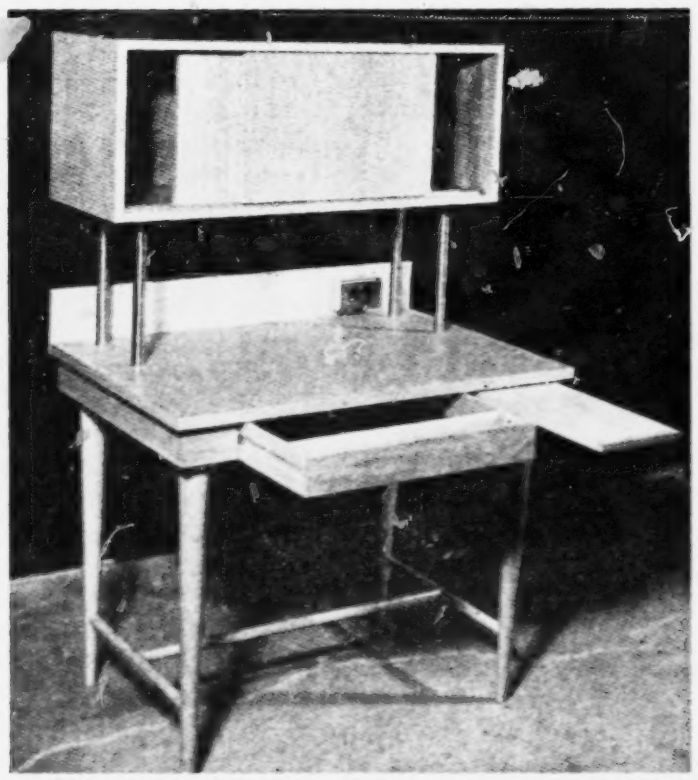


FIGURE 3. Phase 1 Desk



Phase 2A benches (Figure 4) provide areas for laboratory work and for study. Two kneeholes permit the partners to study or work at the same time. Each student has a drawer and cabinet space extending from the top of the desk to the floor on opposite sides of the bench. These desks are mounted on casters and connected for electrical current by heavy duty extension cords. In the long range planning the ultimate use of the Phase 2A laboratory will be for dental students.

GENERAL FACILITIES

Phase 1 and 2A laboratories have independent animal rooms reserved for student use. Equipment includes metabolism cages for rats and dogs, and cages for the general care of small animals (rats, guinea pigs, mice, rabbits, and chicks).

Phase 1 laboratories have been provided with a cold room for the storage of anatomical specimens. The refrigerator measures 8′ by 11′ and has wooden shelves along two sides. The Phase 2A and 2B refrigerators have a 20 cubic feet capacity.

Each of the three laboratories has an independent supply of distilled water. The Phase 1 still has a capacity of 30 gallons per hour, and the excess supply is used by other departments. The Phase 2A and 2B stills each produce 5 gallons per hour which is sufficient to supply student needs. The distilled water is dispensed to the students from 5 gallon reservoir bottles suspended over each sink. From this reservoir there are two outlets. The bottles are connected to central reservoirs having capacities equal to the maximum an-

ticipated use and are equipped with overflow check valves.

The Phase 1 laboratories have a 2-way intercommunication system (Teletalk, Western Electric) which allows communication between the office, stock room and any of the rooms and can be controlled from either the office or stock room. Phase 2A and 2B laboratories have individual public address systems. In each of the three laboratories each student has a coat locker with combination lock located near his own facility.

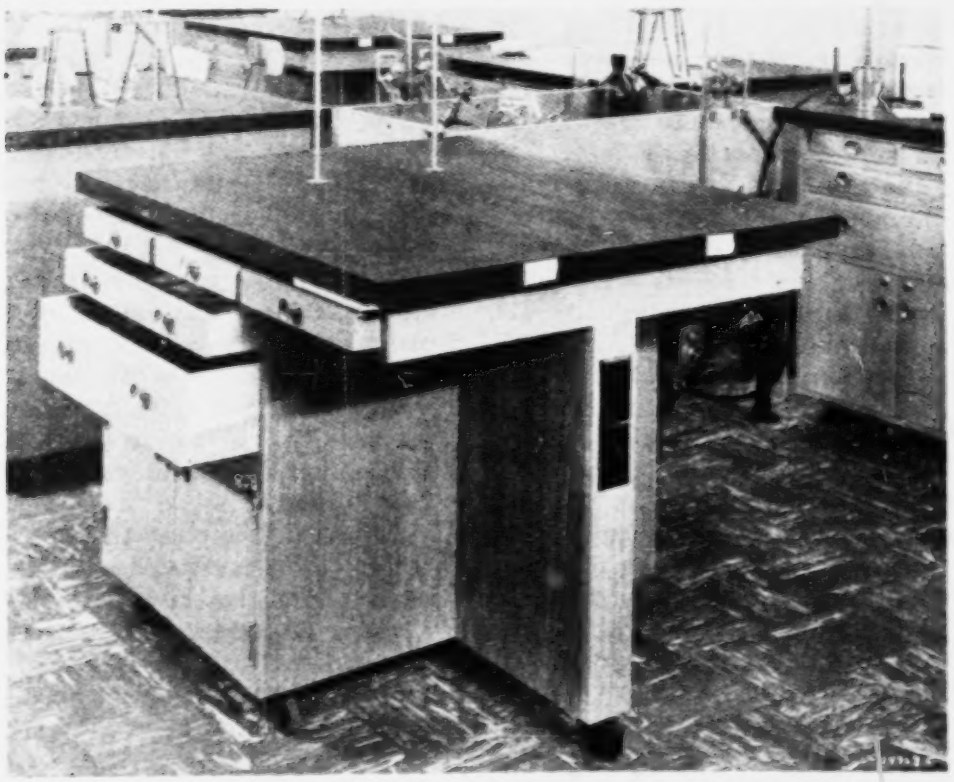
Laboratory Operation

At the beginning of the school year each student selects a partner and the pairs are assigned at random throughout the laboratories.

Subject committees prescribe the laboratory exercises and provide instruction. The Laboratory Manager is responsible for obtaining the program of experiments from the Subject Committee and for preparing the equipment and reagents for testing certain experiments in advance.

In the Phase 1 laboratory one instructor is present in each of the six units during an experiment. The six instructors usually consist of three or more faculty members and three graduate students or senior medical students serving as instructors. Usually, one faculty member and one graduate student or senior medical student se e together in adjoining laboratories. Most of the faculty is provided by the departments whose

Figure 4. Phase 2A Laboratory Bench and Study Bench



methods and subjects are to be demonstrated in the exercise.

Close liaison between the Laboratory Manager and the faculty member responsible for the exercise is required. The burden of preparation is removed from the staff by maintaining adequate equipment and supplies in the stockrooms and regulating their flow to the laboratories. This is done by the Laboratory Manager and the two stockmen who have been trained to prepare solutions, repair, construct, and maintain equipment, to control inventory, and to be aware of their responsibility to the teaching program as a whole.

Prior to the presentation of each exercise the laboratory syllabus is analyzed for supply and equipment requirements. On the basis of these analyses, "Work Orders" are prepared by the Laboratory Manager and issued to a stockman, graduate students, and senior medical students who must prepare and test solutions and equipment. In addition, the stockman receives instructions for dispensing equipment needed by the student to supplement that in his desk and for preparing the laboratory for the exercise. Usually the Subject Committee representatives perform each exercise beforehand using equipment and reagents identical to those to be used by the students. The required number of bottled reagents and supplementary equipment are distributed to the student laboratories. Colorimeters, water baths, and centrifuges are placed on the communal accessory tables. At the end of each exercise the students leave the supplementary equipment on top of their benches where it is picked up immediately by the stockman to be cleaned and prepared for re-use or storage.

Microbiology experiments require a different procedure. The department of microbiology supplies all sterile media and glassware as well as cultures. The stockmen are responsible, by "Work Orders," to obtain the proper material from the media room of the department of microbiology, to dispense it, and return all contaminated glassware and media to be sterilized.

Slide collections for histology, pathology, hematology, and neuroanatomy are maintained by the respective departments. The stockmen distribute and collect them as requested. Gross specimens for anatomy and pathology are the responsibility of the respective departments.

Financial Aspects

A central stockroom supplies glassware and rubber goods to all laboratories in the School. Early in the establishment of the multidiscipline laboratories it was observed that the type of supplies to be stocked could be purchased at a considerable saving if it were possible to take advantage of the maximum discount prices.

The central stockroom is managed by the Laboratory Manager and deliveries are made to the Phase 1 stockman. A modified double entry bookkeeping system is used together with a Kardex perpetual inventory system. Orders are taken by telephone and by requisition with delivery usually made in 24 hours. All accounts are billed for purchases at the end of the month by internal charge memoranda at current catalogue prices.

Although it is clear that the present operation is considerably less expensive than that under the old curriculum, no comparison can be made between the costs for laboratory operation. Since the present bookkeeping system covers both the expenses of the student laboratories and the

central stockroom it is difficult to calculate the cost of the student laboratories alone. It is estimated, however, that the operating cost of the three teaching laboratories is approximately $27,000 including $15,000 for salaries, $3,000 to $3,500 for animals, and $3,000 for glassware, hardware, new equipment, maintenance of facilities, and office expenses.

For listings of equipment provided in student desks, physiology kits, and equipment supplied by the students; laboratory floor plans; inventory, budget appropriation and financial statements for maintenance of the three laboratories, write Dr. Edra Spilman, Phase Laboratory Manager, School of Medicine, Western Reserve University, Cleveland 6, Ohio.

Los laboratorios de la Escuela de Medicina de Western Reserve University

En este artículo se presenta un detallado informe sobre el planeamiento, construcción y funciones de tres laboratorios pertenecientes a la Escuela de Medicina de *Western Reserve University*, en Cleveland (Ohio). Dichos laboratorios, cuya construcción es parte de un reciente programa de Medicina *integrada*, están equipados en forma tal que sirven simultáneamente a todos los Departamentos de la Escuela, en contraste con el tipo usual, designado para uso de un solo determinado Departamento. La función primordial de esos *multidiscipline laboratories*, según el autor del informe, consiste en "dar a cada estudiante su área propia de trabajo, en la que pueda llevar a cabo, independientemente, todos sus ejercicios de laboratorio." Otra función importante es la de centralizar y coordinar las diferentes operaciones de laboratorio de todos los Departamentos de la Escuela.

Separatas del artículo completo en español, podrán obtenerse si son solicitadas por un minimum de 25 lectores.